

REMARKS

This Amendment is fully responsive to the non-final Office Action dated March 4, 2008, issued in connection with the above-identified application. Claim 1-30 were previously pending in the present application. With this Amendment, claims 1, 4, 13, 14, 26, 27, 29 and 30 have been amended; and claim 31 has been added. No new matter has been added by the amendments made to the claims or by new claim 31. Thus, favorable reconsideration is respectfully requested.

In the Office Action, claims 1-5, 7-10, 13-18, 22, 23 and 26-30 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Rigazio et al. (U.S. Patent No. 6,182,039, hereafter “Rigazio”) in view of Pentheroudakis et al. (U.S. Patent No. 7,092,871, hereafter “Pentheroudakis”).

The Applicants have amended independent claims 1, 13, 14, 26, 27, 29 and 30 to further distinguish the present invention from the cited prior art. For example, claim 1 (as amended) recites the following:

“A language model generation and accumulation apparatus that generates and accumulates language models for speech recognition, the apparatus comprising:

a higher-level N-gram language model generation and accumulation unit operable to generate and accumulate a higher-level N-gram language model that is obtained by modeling each of a plurality of texts as a sequence of words that includes a word string class indicating a linguistic property of a word string constituting two or more words; and

a lower-level N-gram language model generation and accumulation unit operable to generate and accumulate a lower-level N-gram language model that is obtained by modeling a sequence of two or more words within the word string class.” (Emphasis added).

The features emphasized above in independent claim 1 are similarly recited in independent claims 13, 14, 26, 27, 29 and 30. Additionally, the features emphasized above are fully supported by the Applicants’ disclosure (see e.g., pages 17-21 and Fig. 3).

The present invention, as recited in independent claims 1, 13, 14, 26, 27, 29 and 30, is directed to a language model generation and accumulation apparatus that generates and accumulates language models for speech recognition. Specifically, a higher-level N-gram

language model is obtained by modeling each of a plurality of texts as a sequence of words that includes a word string class indicating a linguistic property of a word string constituting two or more words. Additionally, a lower-level N-gram language model is obtained by modeling a sequence of two or more words within the word string class. The present invention makes it possible to realize the downsizing of a recognition dictionary and more efficient speech recognition.

In the Office Action, the Examiner relied on Rigazio in view Pentheroudakis for disclosing or suggesting the claimed higher-lever N-gram language model and lower-level N-gram language model of claims 1, 13, 14, 26, 27, 29 and 30. Specifically, the Examiner relied on Rigazio at col. 4, lines 4-29; and Pentheroudakis at col. 6, line 44-col. 7, line 14.

However, the Applicants maintain that the cited prior art fails to disclose or suggest at least the following features recited in independent claims 1, 13, 14, 26, 27, 29 and 30 (as amended):

- 1) a higher-lever N-gram language model that is obtained by modeling each of a plurality of texts as a sequence of words that includes a word string class indicating a linguistic property of a word string constituting two or more words; and
- 2) a lower-level N-gram language model generation and accumulation unit operable to generate and accumulate a lower-level N-gram language model that is obtained by modeling a sequence of two or more words within the word string class.

Rigazio at col. 4, lines 4-29 describes Fig. 2. Rigazio in FIG. 2 illustrates various representational levels of speech, and merely describes that when the level is different, the type of data included in a model (e.g., acoustic phonetics 30 and prosody 42) is different. Nowhere does Rigazio disclose or suggest modeling of words. Conversely, in the present invention (as recited in claims 1, 13, 14, 26, 27, 29 and 30) both the lower-level N-gram language model and higher-level N-gram language model are modeled words. The Examiner also noted this deficiency in Ragazio in the Office Action (see e.g., 3). Specifically, the Examiner noted that Rigazio fails to teach language models that include the use of a word string class and a plurality of text as a sequence of words that include the word string class.

Additionally, the Applicants maintain that Pentheroudakis fails to overcome the

deficiencies noted above in Ragazio. In the Office Action, the Examiner relied on Pentheroudakis for disclosing or suggesting language modeling that included the use of the classification of words or a group of words, which could be used to represent a title (see e.g., col. 6, line 44-col. 7, line 14). However, the classification relied on in Pentheroudakis by the Examiner is implemented merely for a single word, not for a sentence or a series of words.

Specifically, Pentheroudakis describes a technique in which, when a token or word such as "brother-in-law" is included in a sentence, "brother-in-law" is segmented as sub-tokens "brother," "in," and "law." However, during language processing the token "brother-in-law" is still treated as one word. In other words, in the case a sentence like "they are brothers-in-law," the classification described in Pentheroudakis would likely segment "they are brothers-in-law," into three tokens, such as "they," "are," and "brothers-in-law"; and each token would be treated equally.

Thus, the classification disclosed in Pentheroudakis is different from the present application in which the word string class <title> is regarded as a broader concept of "Taiyo-wo-Ute" (Shoot the Sun). More specifically, the present application describes a concept in which, a sentence having a nesting structure such as "Ashita no Taiyo-wo-ute wo rokuga " (Record "Shoot the Sun" tomorrow), is segmented into "Ashita no <title> (title class) wo rokuga" as a higher level model and "Taiyo wo ute" as a lower level model.

In summary, in Pentheroudakis, the token "brothers-in-law" includes only the sub-tokens "brother," "in," and "law." On the other hand, the word string class in the present invention can include various sentences having common characteristics such as "Tenki yoho" (weather forecast) and "Shiretoko no Shinpi" (mystery in Shiretoko), in addition to "Taiyo wo Ute." Thus, as noted above, the present invention makes it possible to realize the downsizing of a recognition dictionary and more efficient speech recognition.

Based on the above discussion, Rigazio and Pentheroudakis fail to disclose or suggest at least the following features recited in independent claims 1, 13, 14, 26, 27, 29 and 30 (as amended):

- 1) a higher-lever N-gram language model that is obtained by modeling each of a plurality of texts as a sequence of words that includes a word string class indicating a linguistic

property of a word string constituting two or more words; and

2) a lower-level N-gram language model generation and accumulation unit operable to generate and accumulate a lower-level N-gram language model that is obtained by modeling a sequence of two or more words within the word string class.

For at least the above reasons, no combination of Rigazio and Pentheroudakis would result in, or otherwise render obvious, independent claims 1, 13, 14, 26, 27, 29 and 30 (as amended). Additionally, no combination of Rigazio and Pentheroudakis would result in, or otherwise render obvious, dependent claims 2-5, 7-10, 15-18, 22, 23, 28 and 31 by virtue of their respective dependency on independent claims 1, 14 and 27.

In the Office Action, claims 6, 11, 12 and 19-21 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Rigazio in view of Pentheroudakis, and further in view of Bakis et al. (US Patent No. 6,023,673).

Claims 6, 11 and 12 depend from independent claim 1, and claims 19-21 depend from independent claim 14. As noted above, Rigazio and Pentheroudakis fail to disclose or suggest all the features recited in independent claims 1 and 14. Additionally, Bakis fails to overcome the deficiencies noted above in Rigazio and Pentheroudakis. Therefore, no combination of Rigazio, Pentheroudakis and Bakis would result in, or otherwise render obvious, dependent claims 6, 11, 12 and 19-21 by virtue of their dependency from independent claims 1 and 14.

In light of the above, the Applicants respectfully submit that all the pending claims are patentable over the prior art of record. The Applicants respectfully request that the Examiner withdraw the rejections presented in the Office Action dated March 4, 2008, and pass this application to issue.

The Examiner is invited to contact the undersigned attorney by telephone to resolve any remaining issues.

Respectfully submitted,

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